

## 5.0 Progress Since Last Review

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The following section presents the protectiveness statements and recommendations included in the Second Five-year Review Report (CH2M HILL, 2001) and an evaluation on follow-up actions completed since the last five-year review.

### 5.1 Protectiveness Statements from Last Five-Year Review

The protectiveness statements made during the last five-year Review (CH2M HILL, 2001) are as follows:

*Regarding the original disposal/source area (Zone 1), institutional and access controls are in place and effective in preventing exposure. With respect to source control, additional long-term remedial actions will be selected and implemented in this area of the site as part of the next ROD. These measures will be designed and operated to meet the RAOs as defined in the final version of the Draft Supplemental Feasibility Study and the next ROD. The remedial actions in place in Zone 1 are meeting the RAOs. The remedy is protective of human health and the environment.*

*With respect to Zone 2, institutional and access controls are in place and effective in preventing exposure. The existing groundwater control/interception system in this area is being operated to its full extent. Although future investigation of the Zone 2 system have been proposed in the Draft Supplemental FS, site monitoring and remediation data clearly indicate that this remedy is protective of human health and the environment.*

*With respect to Zone 3, institutional and access controls are in place and effective in preventing exposure. The existing groundwater control/interception system in this area is being operated to its fullest extent. Although future investigations of the Zone 3 system have been proposed in the Draft Supplemental FS, site monitoring and remediation data clearly indicate that this remedy is protective of human health and the environment.*

*Regarding groundwater plume management in Zone 4, the implemented groundwater extraction system is operating and functioning as intended in the ROD. However, institutional controls in Zone 4 are incomplete in preventing exposure to perchlorate contamination. A protectiveness determination of the remedy at Zone 4 cannot be made at this time until further information is obtained. DTSC will provide sampling data from 15 Zone 4 households with private drinking water wells and data will be compared to the California Department of Health Services perchlorate drinking water action level of 18 parts per billion. DTSC will complete its investigation of Zone 4 households with private drinking water wells, sample well water from those households identified, and provide sampling data. It is expected that these actions will be completed by March 2002, at which time a protectiveness determination will be made.*

## 5.2 Status of Recommendations and Follow-Up Actions from Last Review

Table 5-1 summarizes the status of recommendations that were made during the last five-year review and presents the status of follow-up actions for those recommendations.

TABLE 5-1

Actions Taken Since the Last Five-Year Review

*Third Five-Year Review Report, Stringfellow Superfund Site, Riverside County, California*

Zone	Issue	Recommendation	Status
1	There is an identified need for more comprehensive remedial measures to ensure long-term effectiveness and permanence of the remedy in Zone 1. The Draft SFS has described the deficiencies, technical issues, and RAOs associated with source containment, source control, and dewatering issues.	The final version of the Draft SFS will be used to support the development and selection of source containment, control, and dewatering remedial alternatives, which will be documented in the next site ROD. DTSC is finalizing the Draft SFS, and EPA will issue the next site ROD.	The SFS Report is scheduled for completion in 2007. The fourth ROD amendment is expected in 2008.
2	The existing groundwater extraction system in Zone 2 may not fully intercept and capture site-related contaminants in deeper groundwater in this area of the site.	It is anticipated that modifications and improvements to the existing extraction system, including installation of additional groundwater monitoring or extraction wells, may be successful in accelerating the achievement of the RAOs for the groundwater remedy for Zone 2. Implementation of these recommendations will be pursued as part of the current remedial operations.	Routine groundwater monitoring has been performed since the last five-year review to attain a better understanding of site conditions and to support future evaluations of the need for additional extraction wells.
3	The existing groundwater extraction system in Zone 3 may not fully intercept and capture site-related contaminants in deeper groundwater in this area of the site.	It is anticipated that modifications and improvements to the existing extraction system, including installation of additional groundwater monitoring or extraction wells, may be successful in accelerating the achievement of the RAOs for the groundwater remedy for Zone 3. Implementation of these recommendations will be pursued as part of the current remedial operations.	Twenty-nine monitoring wells were installed since the last five-year review. Routine groundwater monitoring has been performed since the last five-year review to attain a better understanding of site conditions and to support future evaluations of the need for additional extraction wells. An evaluation of the existing extraction system was performed in July 2003 (see Section 7.3).
4	The existing groundwater extraction and treatment system in Zone 4 is functioning adequately to meet the RAOs of the fourth ROD. However, institutional controls (IC) in Zone 4 are incomplete in preventing exposure to perchlorate contamination. The characterization of perchlorate in groundwater is	ICs will be enhanced to ensure that no households are exposed to perchlorate contamination. The perchlorate investigation will be completed and appropriate remedies will be selected and implemented. Optimization of existing system operations should be pursued as part of the current	Glen Avon households with private wells were provided bottled water in 2001 and were connected to the public water supply in 2002. An RI/FS for perchlorate is scheduled for completion in 2008. A ROD that will select a remedy for perchlorate is scheduled for

TABLE 5-1

Actions Taken Since the Last Five-Year Review

*Third Five-Year Review Report, Stringfellow Superfund Site, Riverside County, California*

Zone	Issue	Recommendation	Status
	ongoing. Identification and implementation of further remedial actions is pending completion of the perchlorate investigation.	remedial operations.	2009. A review of Riverside County well restrictions was performed as part of this five-year review.

## 6.0 Five-Year Review Process

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The following sections discuss the findings from the five-year review.

### 6.1 Administrative Components of the Five-Year Review Process

The five-year review was led by Charnjit Bhullar, USEPA's Remedial Project Manager for the site. CH2M HILL provided technical support to USEPA for the review.

This five-year review of the site involved the following activities:

- Review of relevant documents, including routine operations, monitoring and analytical data, and remedial performance evaluations
- Review of federal and state ARARs cited in the RODs for this site
- Review of assumptions and methodology used in the HHRA
- Review of ICs
- Conducting interviews
- Performing a site inspection

### 6.2 Community Notification and Involvement

A notice was posted in two local newspapers (Riverside Press Enterprise Newspaper and La Presna Newspaper) on April 21, 2006 to notify the public that a five-year review had been started for the site.

This five-year review report will be placed in the Stringfellow site information repositories, and a fact sheet will be prepared to inform the public of the findings of this five-year review. The public will be able to submit to USEPA any comments or concerns about the remedy to date.

### 6.3 Document Review

Appendix A provides a list of the documents and reports that were reviewed during the five-year review.

### 6.4 Data Reviewed

The following section presents a summary and evaluation of analytical data for soil, groundwater, and surface water samples collected at the site over the past five years.

### 6.4.1 Soil

A soil investigation was conducted between October 2002 and January 2003 (GLA, 2003a). During this investigation, more than 230 samples were analyzed from on- and off-site locations. Soil samples were collected from on-site locations within Zone 1 and the creek bed of Pyrite Creek downstream of Zone 1. Offsite samples were collected from four adjacent properties. Analytes were most frequently detected at concentrations exceeding the USEPA Region 9 preliminary remediation goals (PRG) in samples collected from the southern disposal area in Zone 1. Total petroleum hydrocarbon (TPH) compounds, VOCs, pesticides, and heavy metals were all detected at concentrations exceeding PRGs in samples collected from this area of the site. Arsenic concentrations detected at offsite locations were within the same order of magnitude as samples collected on-site, which suggests that onsite arsenic concentrations are consistent with background arsenic concentrations for the area.

### 6.4.2 Groundwater

Groundwater monitoring has been conducted at the site since the early 1980s. Since that time, groundwater at the site has been found to be contaminated with organic and inorganic compounds, including TCE, acids, mineral ions, and heavy metals. However, groundwater monitoring performed since the last five-year review has resulted in the identification of additional COCs at the site, including perchlorate, pesticides, NDMA, and 1,4-dioxane.

Several indicator contaminants are currently used as the key parameters to monitor the groundwater contamination at the site. These contaminants include TCE, total VOCs, perchlorate, para-chlorobenzene sulfonic acid (p-CBSA), sulfate, and select metals. TCE contamination distribution maps are provided in Figures 4, 5, 6, and 7 (for Zones 1, 2, 3, and 4, respectively). As presented in the figures, TCE concentrations are greatest in Zone 1, and decrease with distance from Zone 1. Perchlorate has been detected as far south as the Santa Ana River at the southern end of Zone 4 (Figure 8).

Contaminants are being addressed by extraction and treatment systems within all four zones. A new PTP will be designed to treat the recently identified COCs. In addition, the presence of perchlorate in groundwater in Zone 4 has resulted in the need for additional treatment processes at the CWTS. In November 2003, two resin beds were added to the CWTS for perchlorate removal and testing of the effluent for perchlorate was initiated. Monitoring results indicate that the system is effective in reducing perchlorate concentrations in the GAC effluent to levels less than the permitted discharge limit (4 µg/L). There is indication that concentrations of the key parameters (excluding perchlorate) are stable or trending downward in many wells within all four zones. Additional investigation is ongoing to characterize the nature and extent of the perchlorate plume in Zone 4.

### Soil Vapor Intrusion

Exposure to VOC vapors from migration from groundwater to indoor air has become a concern for Superfund sites in recent years. In September 2002, USEPA's Office of Solid Waste and Emergency Response (OSWER) released an external review draft "*Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils*" (USEPA, 2002) that focuses specifically on this exposure pathway.

The indoor air exposure pathway in Zone 4 was previously evaluated in the *Supplemental Health Risk Assessment for Zone 4* (ChemRisk 1995). That report concluded that exposure due

to vapor transport from groundwater in Zone 4 is insignificant compared to exposure through indoor groundwater use. The groundwater vapor flux pathway to indoor air was therefore not included in the supplemental risk assessment since it would be such a small fraction of the total dose. In addition, the assumptions used in this evaluation were conservative. Thus, the approach used would likely overestimate actual expected indoor air concentrations by several orders of magnitude. Based on the evaluation presented in the *Supplemental Health Risk Assessment*, exposure to VOC vapors from migration from groundwater to indoor air is not expected to pose a significant risk to receptors in Zone 4.

While a similar evaluation has not been completed for Zones 1 through 3, TCE concentrations in Zone 3 are less than screening levels for potential vapor intrusion concerns. TCE concentrations in Zones 1 and 2 exceed screening levels for potential vapor intrusion concerns. This exposure pathway is currently incomplete because there are no permanent structures in these two zones. However, an evaluation of the indoor air exposure pathway should be conducted in these zones before buildings or other permanent structures are constructed to determine if this exposure pathway poses a significant risk to future receptors. In the interim, a land use covenant (LUC) may be appropriate to prohibit construction of buildings in these areas.

### 6.4.3 Surface Water

Surface water sampling was conducted between January and March 2005 and between February and April 2006 after periods of moderate to heavy rainfall. Sampling occurred at locations on-site, in Pyrite Creek, and in tributaries to Pyrite Creek. Sample results indicate the presence of metals, nitrate, sulfate, chloride and perchlorate in surface water (GLA, 2005). Perchlorate concentrations were detected above the discharge limit of 4 µg/L in 25 out of 99 samples in 2005 (GLA, 2005) and in 12 out of 31 samples in 2006 (GLA, 2006b). Perchlorate concentrations range from non-detect to 370 µg/L. Perchlorate has been detected at a maximum concentration of 2.8 µg/L in the drainage channels extending directly from the site, suggesting that the site is not a significant source of perchlorate in surface water downstream of the site. Investigations to evaluate off-site sources of perchlorate in groundwater and surface water in the vicinity of the site are being performed as part of an RI/FS for perchlorate.

## 6.5 Site Inspection

Representatives of DTSC, USEPA, and CH2M HILL performed a site inspection on April 10 and 11, 2006. A summary of the inspection findings is presented below. A site inspection checklist and photos taken during the inspection are provided in Appendices B and C, respectively.

Conditions during the inspection were cool and dry. Inspected areas were secured with adequate fencing and signage. The cap appeared to be in moderate condition, with indications of settlement in some areas of the cap. A sink hole had been identified at the southwest corner of northern disposal area during the week preceding the site inspection, and will be evaluated further by contractors to DTSC. Indications of erosion or burrowing were not observed within the vegetative cover during the site inspection. In addition, there

was no indication of erosion in the surface drainage channels that surround the original disposal areas in Zone 1.

Groundwater monitoring and extraction wells appeared to be functioning and in good condition. The groundwater treatments systems (PTP, LCTF, and CWTS) were also functioning and appeared to be in good condition. Applicable O&M plans, health and safety and contingency plans, regulatory permits, and Occupational Safety and Health Administration records were available onsite for review.

Overall, the various components of the remedy appear to be functioning as designed and appear to be well maintained.

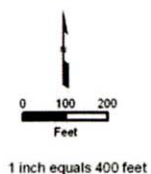
## 6.6 Interviews

Interviews were conducted with DTSC staff between April 7 and April 19, 2006. Interview summary forms are provided in Appendix D. The following DTSC employees were interviewed as part of this five-year review:

- Allen Wolfenden
- Allen Winans
- Roger Paulson
- Ziggy Kostecki

The interviewees have the overall impression that the remedy is effective and contaminant concentrations in groundwater have either stabilized or are decreasing with time as a result of the existing groundwater extraction systems. Due to poor initial characterization of subsurface conditions, additional characterization and evaluations have been performed in recent years to improve the understanding of site conditions. Some of these evaluations and investigations are on-going. DTSC has upgraded the existing on-site treatment systems to address new contaminants identified through recent investigations. The interviewees indicated that a final remedy will be selected for the site following completion of the ongoing evaluations and investigations.



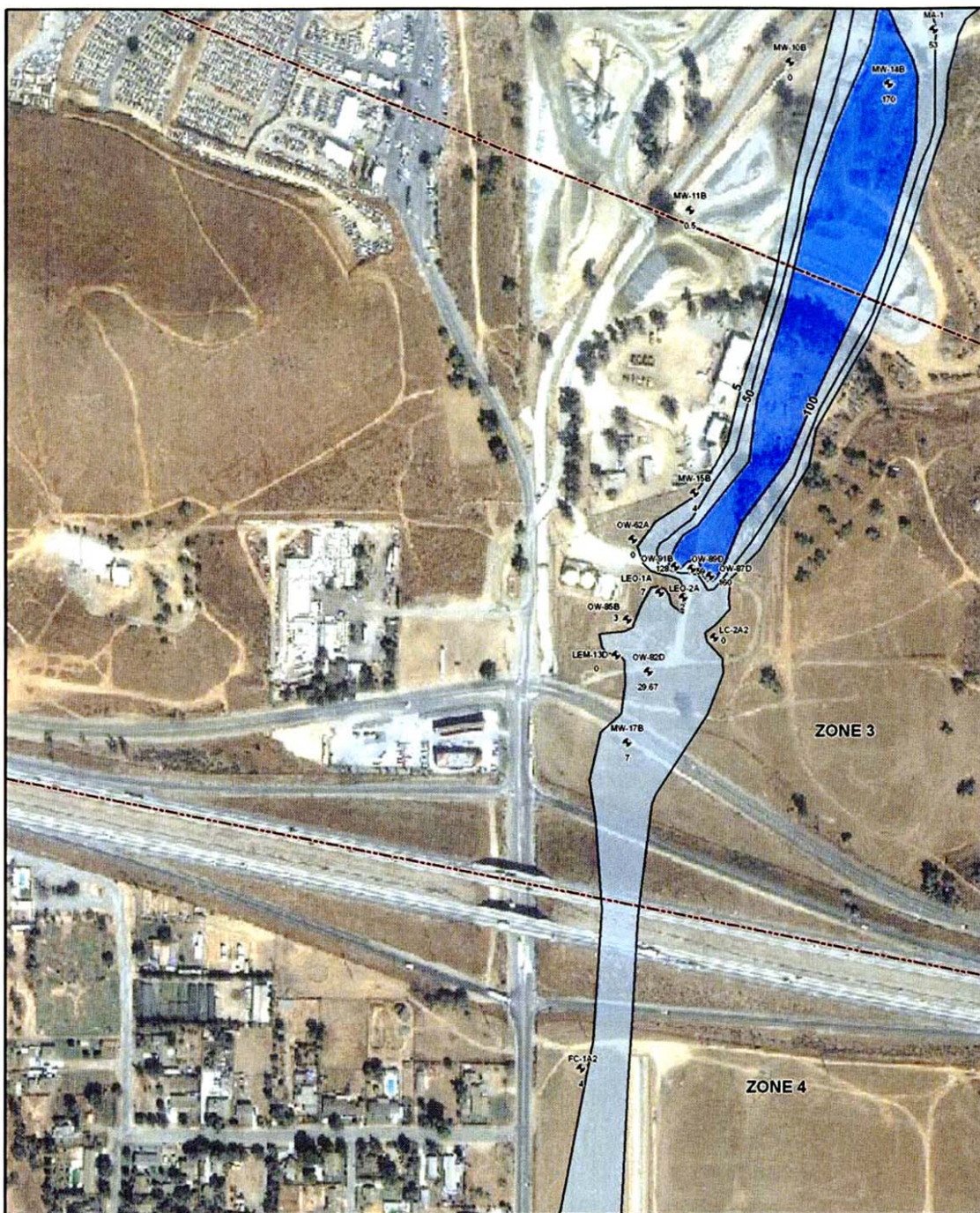


**FIGURE 4**  
**TCE DISTRIBUTION, ZONE 1**  
STRINGFELLOW FIVE-YEAR REVIEW REPORT  
GLEN AVON, CA











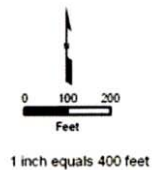
Source: Tetra Tech, Inc., 2004

#### Legend

-  Monitoring Well
-  Trichloroethylene (TCE)  
Concentration Contour, ug/L
- ug/L micrograms per Liter

Period of data: 1/1/2002 ~ 12/31/2002

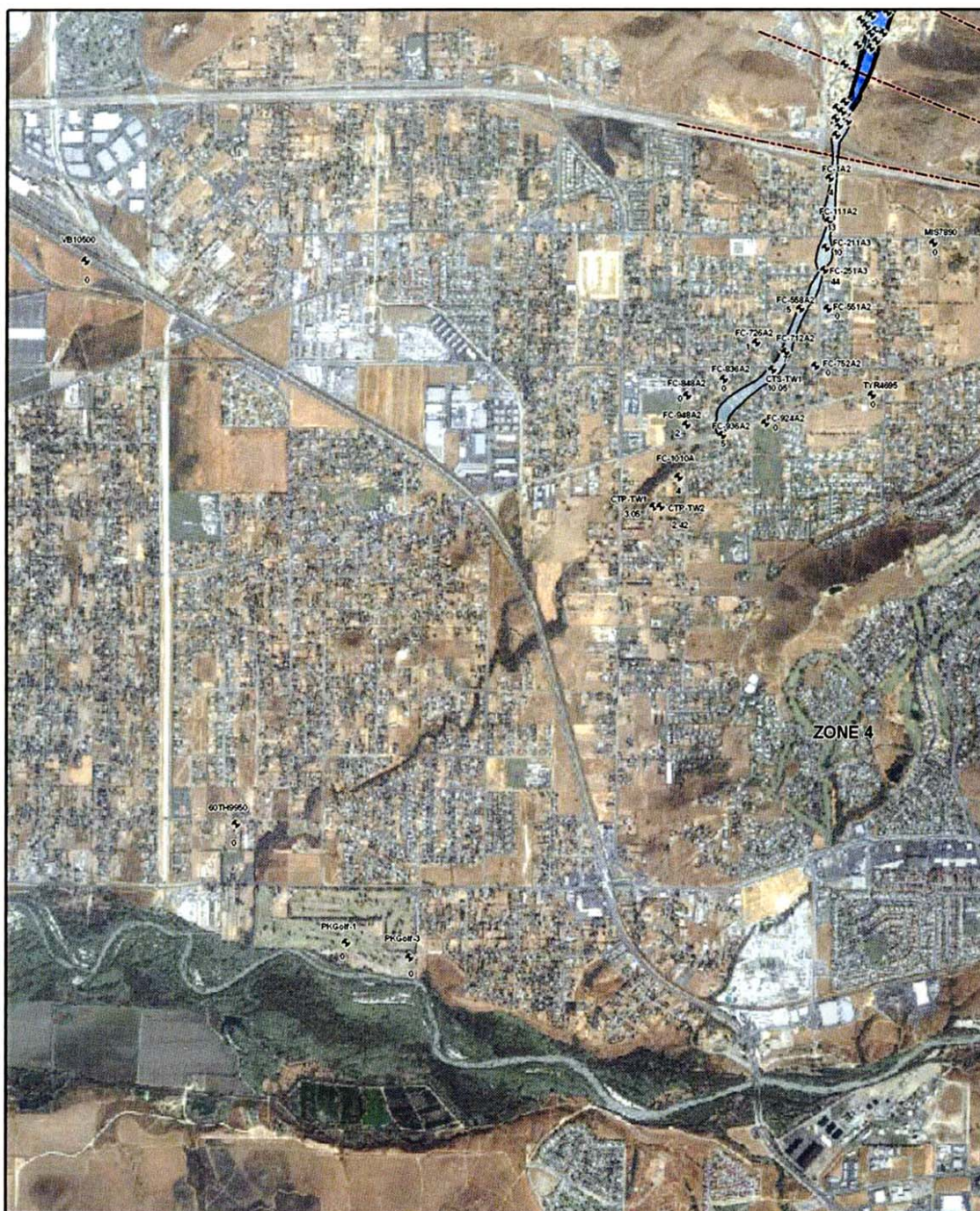
Note: Not all wells are shown due to space limitations.



**FIGURE 6**  
**TCE DISTRIBUTION, ZONE 3**  
STRINGFELLOW FIVE-YEAR REVIEW REPORT  
GLEN AVON, CA



**CH2MHILL**





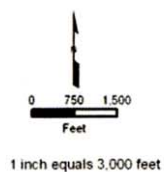
Source: Tetra Tech, Inc., 2004

#### Legend

-  Monitoring Well
-  Trichloroethylene (TCE)  
Concentration Contour, ug/L
- ug/L micrograms per Liter

Period of data: 1/1/2002 ~ 12/31/2002

Note: Not all wells are shown due to space limitations.



**FIGURE 7**  
**TCE DISTRIBUTION, ZONE 4**  
STRINGFELLOW FIVE-YEAR REVIEW REPORT  
GLEN AVON, CA

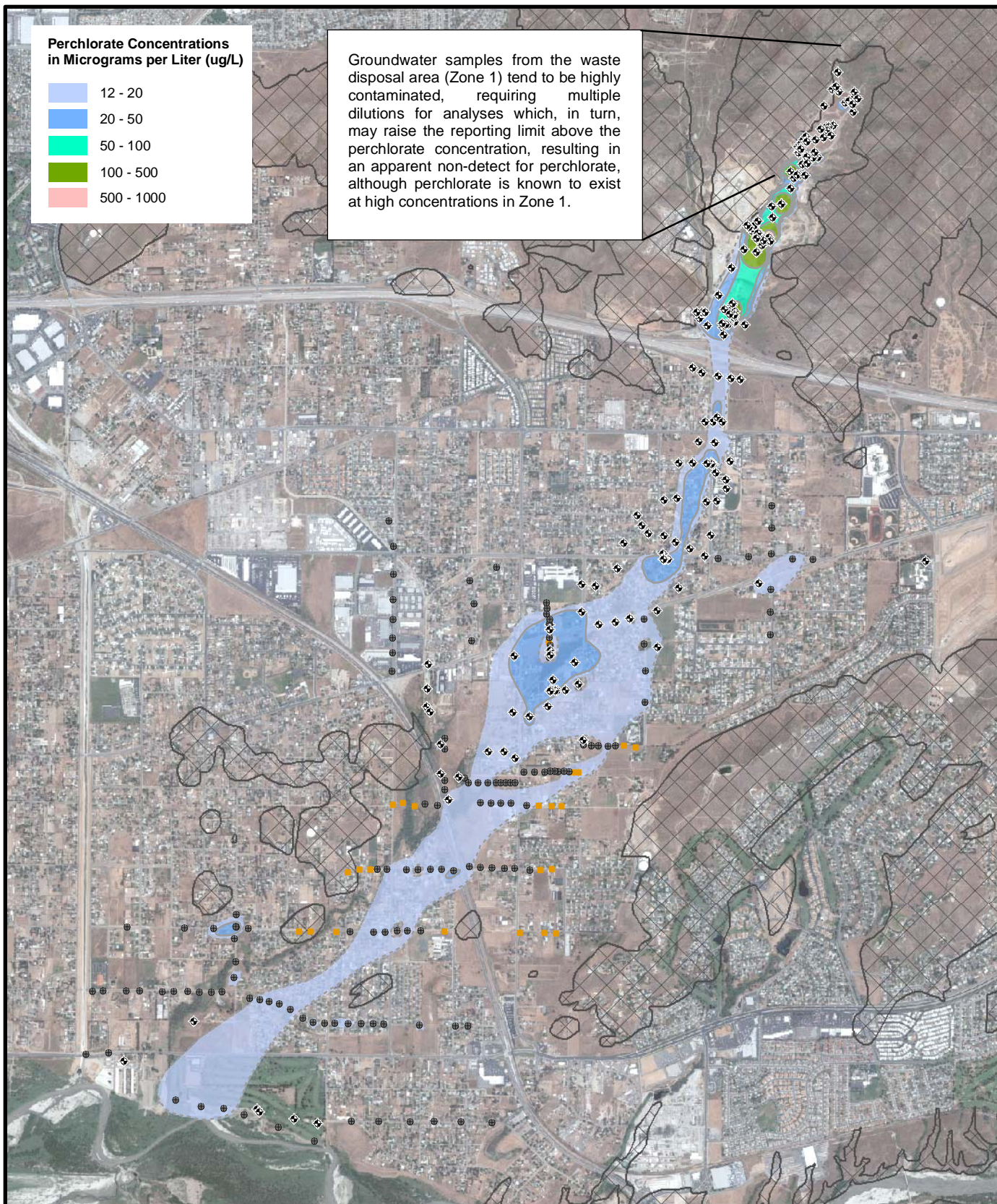
**CH2MHILL**



**Perchlorate Concentrations  
in Micrograms per Liter (ug/L)**



Groundwater samples from the waste disposal area (Zone 1) tend to be highly contaminated, requiring multiple dilutions for analyses which, in turn, may raise the reporting limit above the perchlorate concentration, resulting in an apparent non-detect for perchlorate, although perchlorate is known to exist at high concentrations in Zone 1.



Source: Department of Toxic Substances Control

**LEGEND**

- Monitoring Well
- Sampling CPT
- Groundwater was not found in the alluvium
- Bedrock Outcrop



0 1,000 2,000 4,000  
Feet

Note: The latest data available was used for mapping. At locations where there are clusters of well, CPTs, or piezometers, or where there were duplicate samples, only the highest value was used.

**FIGURE 8  
PERCHLORATE DISTRIBUTION  
IN GROUNDWATER IN ALLUVIUM,  
MARCH 2006**  
STRINGFELLOW FIVE-YEAR REVIEW REPORT  
GLEN AVON, CA

**CH2MHILL**